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ABSTRACT

This essay considers the institution of higher education as a firm. The first part of the paper contains an attempt to construct a theory of enrollment supply. The balance of the paper is devoted to applications of the theory to the problem of price control and nonprice rationing in higher education, to the economics of student scholarships and institutional subsidization, and to a comparison of the market behavior of business and education firms in the context of price control. (Author)

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Barry N Siegel
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TOWARD A THEORY OF THE EDUCATIONAL FIRM

Barry N. Siegel

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TOWARD A THEORY OF THE EDUCATIONAL FIRM

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TOWARD A THEORY OF THE EDUCATIONAL FIRM

Barry N. Siegel

This is an essay upon the institution of higher education considered as a firm. The theory developed in the paper is designed to interpret enrollment and price policies of colleges and universities. The theory is only partial, since it does not treat these institutions as producers, processors, and purveyors of knowledge. Nevertheless, even a partial theory has important uses. Institutions of higher education play a key role in the production of human capital. As such, they are the object of both public and private subsidy and regulation. How the institutions respond to these policies, as well as to ordinary market forces, is an important question for social control.

A theory which purports to explain the enrollment responses of institutions of higher education (IHEs) to market forces and to public policies must create for itself a concept akin to the notion of supply, but the theory must differ radically from the one relevant to the business firm. The latter is built upon the assumption of profit maximization and the theory of production. Unfortunately, profit maximization will not work as a behavioral postulate for the IHE, and we would be hard pressed to describe for it a meaningful production function. What we must do is

find some alternative apparatus to describe its modus operandi. A supply function should, hopefully, emerge from the apparatus.

The first part of the paper contains an attempt to construct a theory of enrollment supply. The balance of the paper is devoted to applications of the theory to the problem of price control and nonprice rationing in higher education, to the economics of student scholarships and institutional subsidization, and to a comparison of the market behavior of business and education firms in the context of price control.

The Theory of Enrollment Supply

I shall approach the problem of enrollment supply through the theory of choice. I shall assume the IHE to be dominated by an institutional utility function and that, subject to certain constraints, it attempts to maximize its utility.[1]

Institutions of higher education can be classified according to whether or not they have control over price (tuition and fee levels) and over the admission and retention of students. It will be convenient to start with the case in which such internal control exists and is freely exercised. Such an institution is faced with relatively simple constraints. Its activities are limited by the amount of income

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[1] The approach is strongly reminiscent of the one used by Oliver Williamson (1964) in his work on the theory of the firm, except that it is applied to public and semi-public institutions rather than to private business firms. See Alchian (1965) and Johnson (1966) for further discussions of this approach.

it receives from various sources: income must equal outgo (except when the institution can borrow or make expenditures out of accumulated savings, cases which I shall not consider). Income comes from grants, subsidies, endowments, and student charges. Grants, subsidies, and endowments are to some extent outside of the control of the institution. Though both private and public IHEs can often bargain effectively with private and public donors, in the last analysis the decision to part with money lies in the hands of the donors. Fortunately for many public schools, however, legislators can often be persuaded to adopt formulas which relate public subsidies at least in part to enrollment. To this extent, a public IHE may vary its income by varying its enrollments, but the formula by which such discretionary income is generated is ultimately determined outside the institution.

An analogous situation holds with respect to income from student charges. An IHE faces a demand curve for its enrollments.[2] Both the position and slope of the demand curve can be manipulated by the institution if it engages in activities which differentiate its product from that of other institutions. Nevertheless, internally induced changes take time. For the near term, IHEs face demand curves which are determined by forces outside their control. Hence, an institution can vary

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[2] See Campbell and Siegel (1967) for an estimate of the aggregate demand for enrollments in the United States. This study uncovered evidence that enrollment demand is sensitve to tuition and fee levels. It was this evidence which led me to think about the supply side of the problem.

its income by varying its price, but the extent to which it can do so is limited by the market in which it deals.

It follows that a typical IHE possesses an opportunity locus describing the alternative combinations of income and enrollments available to the institution under given conditions. This locus, which by the budget constraint also describes combinations of maximum expenditures and enrollments, is depicted in the lower part of figure 1 by the curves labeled L. If the IHE sets its price high enough, its income will be composed solely of lump sum grant, subsidy, and endowment income (point G in the figure). Additional income will be purchased by a reduction in price and an expansion of enrollment. If part of the subsidy received by the IHE is contingent upon enrollment, the additional income resulting from an exploitation of the demand function will be joined by further subsidies. Nevertheless, at some point before price drops to zero, L will probably reach a maximum and the institution will lose income by accepting more students. An increase in demand will stretch the locus up and to the right as depicted by the movement from L_1 to L_2. An increase in lump sum grants, endowments, or subsidies will produce a parallel upward shift of L. Changes in the slope of the demand curve or in the formula by which subsidies are related to enrollments will lead to changes in the curvature of L at various enrollment points.

We are now in a position to state our problem more clearly. Under given conditions, an IHE will select some combination of income and enrollment

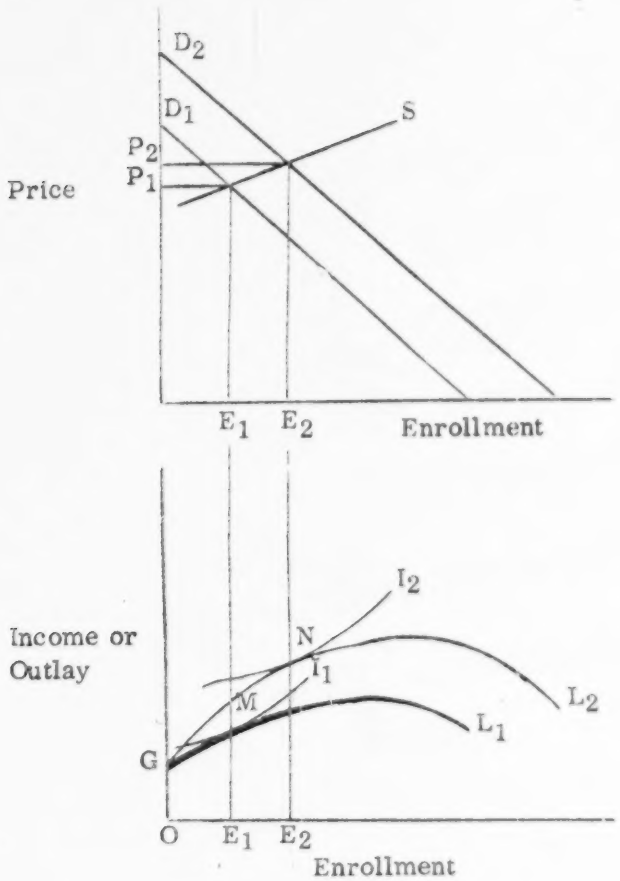

FIGURE 1
DERIVATION OF ENROLLMENT SUPPLY FUNCTION

(some point on L) at which it wishes to operate. Since such a choice also involves setting a price, the instituion will also be on a point on its supply function. A change in conditions will of necessity force the institution to reconsider its price and enrollment policies. If we can find the alternative combinations of prices and enrollments the institution will accept under various conditions, we will, in effect, have traced out its supply function.

The utility map sketched out in figure 1 is the device I shall use in illuminating the IHE's price and enrollment policies. The map assumes that the IHE's subjective marginal rate of exchange between income (expenditure) and enrollments is positive: The institution must receive extra income as compensation for extra students in order to keep it at the same level of satisfaction. Conversely, if the institution is deprived of some of its income, a reduction of enrollment will be required. This is not an absurd assumption. For any given combination of expenditure and enrollment, an institution will presumably allocate its resources in a way which best fits its research and teaching goals. This allocation will imply a certain quality of faculty, a certain load on the faculty, and a certain load on the administration, library, equipment, etc. Each of these loads will lead to an appraisal by the administration of the overall quality of its program. An uncompensated enrollment expansion would force the institution either to increase the load on its faculty, administration, and facilities, or to reduce the overall quality of the faculty. All of these adjustments

would usually diminish in some degree the quality of the IHE's program as appraised by its administration.

Higher indifference curves reflect preferred combinations of income and enrollment. We should therefore expect an IHE to optimize its position by choosing a point on a given locus which is also the point touching the highest indifference curve of all which touch upon the locus. In figure 1, point M is an optimum for locus L_1, which is associated with the demand curve labeled D_1. This point sets enrollment at E_1 and price at P_1. Point M is on the IHE's supply curve.

We can generate another point on the supply function by considering the effects of an increase in demand from D_1 to D_2. The increase in demand shifts the opportunity locus to L_2 and the optimum income-enrollment combination to point N. The new preferred price-enrollment combination, P_2 and E_2, clearly depends upon the shape of the utility surface in the lower part of figure 1. If the indifference curves drift up and to the right, as in the figure, the institution's optimal price and enrollment will both increase. The supply function, in other words, will have a positive slope.

Although in what follows I shall consider the above case as the dominant (or "normal) one, other cases are perfectly possible. A highly exclusive school, for example, would be characterized by an indifference curve system in which the higher curves are the steeper ones. Here the supply function may be "backward rising," as the institution takes advantage of the increase in demand to raise price and reduce enrollment. At the other extreme is the case resulting from a revenue-maximizing public institution with flat indifference

curves. If such a school has a subsidy formula which allows it to more than offset losses in tuition income from a price cut with gains in subsidy income from enrollment increases, its revenue will be maximized by always charging a zero price. The enrollment supply function will then coincide with the abscissa in the upper part of figure 1.

Although I have not shown it in figure 1, the reader can verify for himself that in the "normal" case an increase in lump sum subsidies, grants or endowment income will lead to both a reduction in price and an increase in enrollment along any given demand curve, i.e., a shift of the supply function down and to the right. Increases in lump sum income will not increase supply if the indifference curves are vertically arrayed or if the higher curves are the steeper ones. In the latter case, the supply function will actually shift to the left with an increase in lump sum income.

How is the supply function affected by a change in costs? Here we are hampered somewhat by my failure to develop a theory of internal resource allocation for the IHE. Nevertheless, I think we can develop a plausible answer to the question if we express the institution's income in real terms. An increase in costs, say faculty wage rates, is equivalent to a reduction in real income. If the opportunity loci in figure 1 are defined in terms of a given structure of faculty wage rates, the increase in wages will have the effect of depressing each locus. The effect will be similar to a decrease in lump sum subsidies. Consequently, for an institution with a "normal" utility map, the supply function will shift to the left with an increase in wages. If the institution has a map appropriate to the exclusive school case, the supply function will shift to the right.

This, then, is my theory of enrollment supply. Unlike the theory of supply for the individual business firm, the shape of the function is not affected by the principle of diminishing returns. It is true that the enrollment supply function is affected by changes in costs and subsidies in much the same way that a supply function for the business firm would be affected; but, as the case of the exclusive school should warn us, we should not press this parallel too closely. As I shall further emphasize below, there is an important difference between a firm which maximizes its profits and an institution of higher education which maximizes its utility.

Price Control and Nonprice Rationing

The test of any model is its usefulness as an explanatory device. The model of the previous section has already been used to construct a supply function and to discuss some of the factors leading to changes in the price and enrollment choices of institutions of higher education which are able to pursue their own goals. In this section we shall be interested in the consequences of price control. Many public institutions must practice such control because of pressure from authorities and the public to keep the price of a college education within reach of the common man. The same factors force many private institutions to keep prices down.

The situation is portrayed in figure 2. A maximum price, P_m, causes the opportunity locus to take the shape indicated by the function labeled GHL: up to E_2, income can grow only in proportion to enrollment. If the IHE were to accept all students who wished

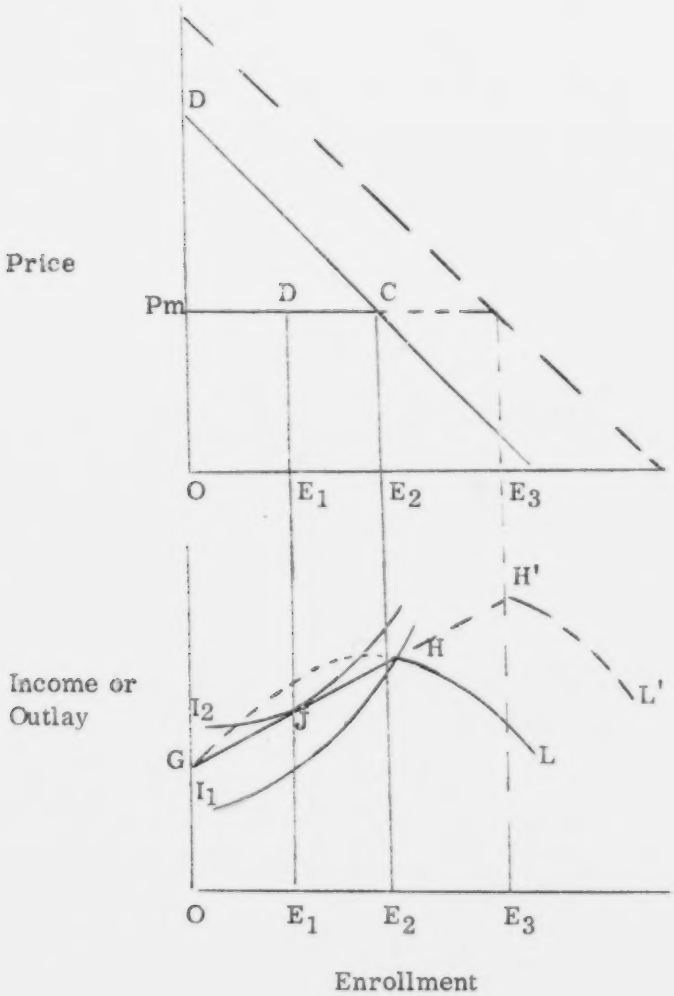

FIGURE 2
PRICE CONTROL AND NON PRICE RATIONING

to enroll at the maximum price, it would find itself at point H. Point H, however, is inferior to point J, which is also on the new opportunity locus. In order to reach point J the institution must indulge in nonprice rationing of some sort. As a result, the institution will find itself with a price-enrollment combination off of its demand curve: point D in figure 2. Note that nonprice rationing costs the institution something: E_1DCE_2 in the upper part of the figure.

Now, imagine a shift in demand as shown by the dotted demand curve. If the maximum price holds at P_m, the opportunity locus will change to GH'L'. In this situation, where lump sum grant or subsidy income remains unchanged, the institutional response will be solely in the form of further nonprice rationing, a further tightening of standards. If we had assumed an increase in lump sum income, of course, our result would have been different. Such an increase would have caused a vertical shift in the opportunity locus. With a "normal" preference map --one which drifts to the right as the level of utility rises--the impact of demand on nonprice rationing would have been offset by the rising level of grants or subsidies.

This discussion points to a useful distinction between what might be called induced changes in standards and autonomous changes in standards. Induced changes are those which, in the context of price control, arise from a lag of grant or subsidy income behind increases in enrollment demand. Autonomous changes in standards arise from factors which rotate the indifference curve system. It is a common observation that standards in American higher education have been rapidly

improving in recent years. The improvement has reflected itself in higher admissions standards in many institutions and also, perhaps, in tougher performance standards. It would be interesting to know how much of this purported improvement in standards has been induced and how much is of the autonomous variety.

Certainly, the environment for both has been present. The vast sums of federal research money now available in many fields of study must surely have encouraged a change in tastes--a counterclockwise rotation of indifference curves--in many institutions. If so, much of the observed improvement of standards may have been a reflection of institutions' limited ability to raise their prices and of the failure of governments to provide the increased subsidies made necessary by the change in tastes. To be sure, there has been enormous pressure upon educational facilities from the demand side. Enrollments have more than doubled in the last ten years. Some of this pressure has been met by increased subsidization, some by increases in tuitions and fees, and some by a raising of standards. The point here is that further pressure on both prices and standards has probably emanated from factors which have encouraged a change in tastes of a large number of institutions of higher education.

One of the effects of this dual set of forces has been the rapid development of new four-year colleges and of junior and community colleges. Many of these institutions have been designed to deal with the spillover of students who have been unable to meet either the prices or the standards of older four-year institutions.

The newer institutions are subject to the same forces as the older ones. A lag of grant or subsidy income behind demand, with little or no control over price, may force them to improve their standards and come, almost willy-nilly, to resemble the institutions they were designed to complement. Some schools in the California State College System have evolved rapidly in this direction in recent years.

The Economics of Scholarships--The Principle of Joint Subsidy

In recent years there has been a great expansion in scholarship and loan programs, particularly by the federal government. In addition, banks and other financial institutions have been expanding their activities in the field of educational lending. The probable effect of these changes has been to accelerate the growth in enrollment demand. Indeed, this has been the purpose of the federal programs. What does our model say about the conditions necessary for success in these programs?

First it should be apparent that an increase in demand does not necessarily produce an increase in enrollments. If institutions of higher education pursue fixed price policies, the increase in demand may be met simply by induced improvements in standards. If so, the federal programs will raise student quality rather than student numbers. Second, institutions may respond to the increase in demand by raising their prices, but since prices are usually initially set below their equilibrium levels, the increase in enrollment depends upon the slope of the institutional supply function, not upon the demand curve. The supply curve may be steep

enough to prevent enrollment from rising in proportion to the increase in demand. If federal programs are to have their full impact upon enrollments, then one of two things must occur. Either an autonomous deterioration in standards must take place, or subsidies to students must be accompanied by subsidies to institutions. It hardly need be stated that in today's environment a deterioration in standards is not a serious possibility.

There is a principle lurking in this discussion--what we might call the principle of joint subsidy. Assume that at any moment of time there exists an excess demand for enrollments, as measured in figure 3 by the horizontal distance DC. Given its utility function, a certain level of grant, subsidy, and endowment income and a maximum price of P_m, an IHE will be in equilibrium with an enrollment of E_1. The institution will be applying a set of standards which exactly rations enrollment to E_1 rather than to the level of E_3, which is the desired or equilibrium level of enrollment from the students' point of view. Now, assume a program of subsidies to students which has as its goal a certain increase in actual enrollments. These subsidies will shift the enrollment demand curve; but, so long as P_m remains, enrollments will remain fixed at E_1, even though enrollment demand at that price will rise to E_4. A subsidy to the institution which shifts the supply curve is necessary before the student subsidies can take effect. To be sure, a rise in price above P_m would reduce the need for the additional subsidy to the institution; however, such an increase would price a number of students out of the market.

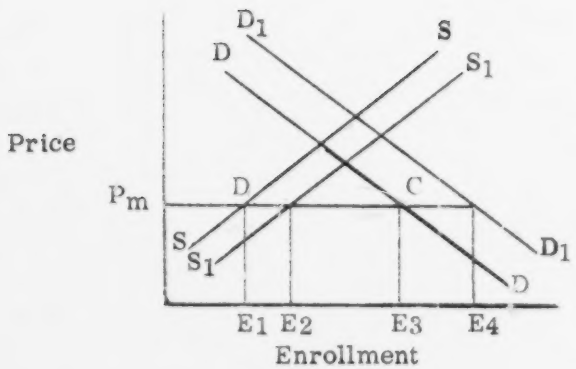

FIGURE 3

EFFECTS OF SUBSIDIZATION

Figure 3 raises another issue. If the purpose of national policy is simply to raise enrollments, is a policy of student subsidies necessary? After all, to raise enrollments from E_1 to E_2 in the diagram is it not necessary only to subsidize the institution? The answer depends on the possibility of inducing a deterioration of standards in the institution. If standards are flexible upwards but inflexible downwards, a simple policy of institutional subsidy will not work. A movement from E_1 to E_2 by means of a supply shift implies a reduction of the excess demand gap E_1E_3. Such a reduction can only come about through a reduction of enrollment demand or through a reduction of standards. In the real world, the latter may not come. Hence, whether we work from the side of the institution or the side of the student, a subsidy to one may require a subsidy to the other.

Joint subsidization is probably too weak a phenomenon to be a true principle. Nevertheless, public authorities seem to recognize its existence. For example, student scholarships provided by the National Defense Education Act have been coupled with subsidies to the institutions in which the scholarship recipients are enrolled. One interesting by-product of this program may well be a more rapid evolution of nonprice rationing in participating institutions. The presence of NDEA scholarship students may cause these schools to acquire a taste for better students and to translate these newly acquire tastes into improved standards for all students.

Price Control and Market Behavior

The "principle of joint subsidy" is actually a reflection of a phenomenon

which is very familiar to economists. Any time prices are not allowed to move freely there is likely to occur a failure of markets to allocate resources in conformity to the wishes of people in the market. In the present instance, prices are usually set below the equilibrium or market clearing level. A wedge is driven between demand and supply. Variations in demand, by themselves, do not induce institutions to offer more educational services. Because of this, institutions are not moved to increase their demands for educational "factors of production," and society finds itself, in a sense, underinvesting in education. Society attempts to correct this underinvestment by resorting to a system of subsidies both to public and to private institutions. It is almost unnecessary to add that the final solution need bear no resemblance to the solution provided by free markets.

It is also of interest to contrast the consequences of price control in the field of education with the consequences of similar controls in the business world. During World War II and again during the Korean War, prices were frozen below their equilibrium levels by the government in order to prevent the excess demands generated by military expenditures from expressing themselves in the form of open inflation. These controls also had the virtue of redirecting some of the flow of resources away from civilian production into military production. All sorts of evasions were tried, but from our point of view one of the most interesting consequences of the system was an attempt by businessmen to respond to the state of excess demand by selling lower quality products. This response to price control

is almost precisely opposite to the response we have postulated for higher education. We have argued that institutions of higher education respond to excess demand with an improvement, not a deterioration, of standards. How to explain the difference?

First, it is important to note that universities and colleges sell enrollments, not products; and, to some extent, enrollments and products are not logically the same thing. An enrollment is a place to fill. From the standpoint of the student, to be sure, the place may be a good one or a bad one, just as a product may be a good one or a bad one. But, from the standpoint of the institution, a place may be a thing to fill with a good or bad student, and it is from this perspective that we have been speaking of the response of higher education to price control and excess demand.

It is this difference in perspective which explains the contrasting responses of business and educational institutions to price control. Since businessmen strive for profits, they must tailor their product to meet the state of market demand. Educational institutions, on the other hand, strive to maximize institutional utilities. Consumers' sovereignty does not guide their actions. As a result, the consumer must tailor his behavior to meet the demands of the institution. Price control gives the businessman the opportunity to reduce the quality of his service to the consumer. Price control gives the IHE the opportunity to demand a higher quality of performance from the consumer.

Concluding Comments

Institutions of higher education administer resources which, in today's world,

are crucial to the process of economic development. To my knowledge, there does not exist a theory which discusses the manner in which these institutions administer these highly specialized resources. I regard this study as an initial probe into the area. As such, it is narrowly focused upon the behavior of the individual institution. The behavior of the whole industry must await further analysis; but, before such an analysis is attempted, we must get straight the behavior of individual institutions.

Whether or not I have started out on the right path is hard to say. I am acutely aware of at least one problem in my approach. I have assumed a single utility function for the institution. Those familiar with the administration of colleges and universities know well that they are often characterized by a variety of utility functions. Clark Kerr's "multiversity" fits many cases better than the ancient term "university." Yet basic decisions must be made by someone. The administrator is more than a mere mediator of contending factions. He decides as well as mediates. In doing so, must he not inevitably be imprinting his philosophy upon the institution?[3] If so, we may be permitted to speak of a single utility function for the institution. If not, then we must modify the conception of the educational firm presented in this paper.

But whatever approach finally proves to be most useful, the problem should be attacked. Indeed, there are many areas outside of higher education in which

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[3] Kerr (1964, pp. 29-41) does see the university president as more than a mediator. Indeed, he calls the president a "mediator-intiator."

similar theoretical work is sorely needed. A very large proportion of our resources are today administered by institutions other than the business firm. Some of these institutions are public and some are private. They operate under a variety of constraints and with a variety of goals. The principles by which these various organizations allocate their resources and the ways in which they affect resource allocation in general are as important an area for economic research as the institutions of the private business sector.